CHEMICALS

Project Fact Sheet

Development of a Data Processing Scheme for Plastic Identification

Benefits

- Potential energy savings in excess of 400 billion BTU per year nationwide
- Improves the speed, accuracy, and efficiency of existing consumer plastics sorting technologies
- Significantly increases the cost-effectiveness of recycling services
- Increases the value of recycled plastic resins by 15 to 20 percent because of higher purity

Applications

The developed technology will be used to greatly increase the efficiency of plastics recycling in existing community and industrial operations. Project partners have focused on identification of common household plastics processed in materials recovery facilities. In addition, sorting of industrial plastics such as automobile parts can benefit from faster and more accurate identification.

Algorithm allows for the rapid and accurate identification of plastic waste in recycling operations

Over 700 million pounds of waste plastics are recycled each year in the United States. Sorting of the incoming plastic waste is critical since low-value plastics such as PVC pyrolyze at a much lower temperature than other high-value plastic waste, causing thermal processing to produce a poor quality product. Therefore, rapid and accurate identification of the type of plastic during sorting operations is essential for producing a high-quality recycled product at competitive prices. Currently, humans perform sorting manually, which is accurate but expensive. Machines for automated sorting of plastic are available, but are complex, expensive, and are limited in speed and accuracy by inefficient sensor and data processing schemes for identification of plastic type. Project partners are addressing these limitations by developing a new data processing scheme that will increase the accuracy and efficiency of existing sorting instruments.

The developed data processing scheme will utilize a highly accurate identification algorithm that is based on a large spectral database of commonly used plastic containers. The algorithm is tuned to the optimal number and location of spectral bands necessary for the identification of each type of plastic. By optimizing the selection and processing of these wavelengths, project partners have demonstrated that substantial improvements in sorting accuracy can be achieved. In addition to sorting recycled consumer plastics, researchers will investigate the extension of the optimal reflectance algorithms to the sorting of recycled automotive plastics.

Sorting Equipment

The new data processing scheme will be used in existing plastic sorting operations like the one shown above.

Project Description

Goal: The goal of this project is to develop a data processing method that utilizes an identification algorithm to be installed into existing plastic sorting instruments that make spectrally resolved optical reflectance measurements. The new algorithms will enhance the speed and accuracy of identification and will provide the ability to sort between plastics with small variations in composition.

Progress and Milestones

Early stage research devised an improved algorithm for plastic identification. The following specific tasks were accomplished:

- Generated a detailed near-infrared spectral reflectance database of commonly used industrial and consumer plastics
- Determined an optimum number of discrete spectral bands necessary to discriminate among the plastic types
- Developed a rule-based data processing algorithm for automatically sorting random samples of plastics
- Demonstrated improved sample identification compared to industry-standard devices

Current research is focused on achieving the following milestones:

- Implement and further refine the identification algorithm on a commercial reflectance sensor used in full-scale sorting systems for plastic identification
- Demonstrate better than 95 percent accuracy in identification of common plastic objects in a laboratory environment
- Demonstrate better than 95 percent accuracy in identification of moving plastic objects on a laboratory conveyer belt
- Produce a final design and implement the algorithm on a commercial sorting system in conjunction with a major supplier of sorting systems
- Examine possible extensions of the consumer plastics recycling algorithm to automotive plastics recycling

Project Partners

Physical Sciences Inc.
Andover, MA

MSS Inc.
Nashville, TN

Arthur D. Little Inc.
Cambridge, MA

For additional OIT program information, please contact:

Charles Russomanno
Office of Industrial Technologies
Phone: (202) 586-7543
Fax: (202) 586-1658
charles.russomanno@ee.doe.gov

Visit our home page at
www.oit.doe.gov/chemicals

For information on the SBIR program, please contact:

Robert E. Berger
SBIR/STTR Program
Phone: (301) 903-1414
Fax: (301) 903-5488
sbir-sttr@science.doe.gov

Visit the SBIR home page at
http://sbir.er.doe.gov/sbir

Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, D.C. 20585

OIT

September 2001